Why do people consume video game live streaming on the platform? An exploratory study connecting affordance-based gratifications, user identification, and user engagement.

Authors:

Jing Zhang

Email: jzhang77@uncc.edu

The University of North Carolina at Charlotte

Riwei Liu

Xiangsihu College of Guangxi University of Nationalities

Section:

#AUD: Digital Audiences

ID number:

2544

Abstract

Game live streaming has become a flourishing phenomenon worldwide, yet research has primarily focused on understanding user consumption behavior from a socio-psychological perspective, neglecting the role of technological affordances. This study addresses this gap by proposing a theoretical framework that integrates affordance-based gratifications, user identification, and user engagement. Drawing upon the uses and gratifications theory, social media engagement theory, and social identity theory, we conducted a survey with 565 participants in mainland China. The findings reveal that interactivity-based gratifications significantly influence both primary and secondary levels of engagement, while modality-based gratifications primarily impact primary engaging behaviors. Furthermore, user identification acts as a mediating factor in the relationship between affordance-based gratifications and engagement. These results offer valuable empirical evidence for scholars and practitioners to consider technological factors when examining user engagement on game live streaming platforms. The study suggests enhancing interactivity functions and emphasizing the role of live streamers to foster user engagement. By understanding the importance of technological affordances, this research contributes to a comprehensive understanding of engagement in the game live streaming industry.

Keywords: Game Live Streaming, Use and Gratification 2.0, Social Media Engagement, Fan Identification, Live Streaming Platform

1. Introduction

Ever since McLuhan's (1964) seminal work which emphasized the significance of comprehending the crucial role played by the technological aspects of a given medium, numerous communication scholars have delved into exploring the influence of media technology on human communication (e.g., Halpern & Gibbs, 2013; Nagy & Neff, 2015; Schultz et al., 2011). The rise of the platform economy has further highlighted the importance of understanding how the embedded functions of social media platforms, known as affordances, shape users' experiences and impact their usage habits beyond users' personal needs (Kaun & Stiernstedt, 2014; Ruggiero, 2000; Zhou & Pun, 2022). In particular, the live streaming platform, where users can watch real-time and live videos delivered by streamers, has become one of the most important forms of platform economies today. Alongside the live streaming functions embedded in other social media platforms, dedicated professional live streaming platforms like Twitch.tv, Douyu, and Huya are booming in this sector. In China alone, the number of live streaming users reached 305 billion by June 2022 (CNNIC, 2022).

However, three unresolved issues regarding live streaming persist in the context of understanding the technical affordances in the platform society. Firstly, it is essential to consider the affordance-based gratifications of live streaming platforms to further comprehend the motivations behind users' activities on the platform. Affordance-based gratification was proposed by Sundar and Limperos (2013) as a complement to the uses and gratifications theory, expanding the original theory's social and psychological motivations by incorporating the perspectives of embedded technical affordances. This suggested that users' media consumption was influenced not only by their personal needs but also by the media technology itself. In comparison to other social media platforms that provide friend connections, microblogging, short-form video, or

photo sharing (Stec, 2015), the real-time video sharing and the highly interactive nature of live streaming platforms necessitate a deeper understanding of this new form of social media platform and its influence on users' media consumption and engagement in live streaming (Hilvert-Bruce et al., 2018).

Secondly, it is crucial to consider the variables of user behaviors and engagement afforded by live streaming platforms. Previous studies have categorized social media engaging behaviors into different layers based on the varying levels of cognizant or monetary efforts involved (e.g., Kim & Yang, 2017; Meng & Leung, 2021; Muntinga et al., 2011). In addition to common behaviors like watching, liking, following, creating, and sharing, live streaming platforms introduced unique engagement behaviors such as gift-giving, through which users give virtual gifts to the streamers (Li & Peng, 2021; Zhang, 2022). While some studies have focused on understanding creating danmuku and gift-giving behaviors in live streaming (e.g., Li & Guo, 2021; Li & Peng, 2021), the classification of engagement and its connection with technical affordances remains unexplored.

Finally, the high interactivity afforded in live streaming embodied a relationship between live streamers and fans, which formed a distinctive fan group type compared with fans affiliated with celebrities or textual content. Live streamers may perform activities such as singing, dancing, playing computer games, or engaging in real-time online chat, establishing an emotional bond between themselves and their fans (Woodcock & Johnson, 2019; Zhang & Hjorth, 2019). The role of this emotional bond in users' engagement behaviors on the platform remains unclear and requires empirical research.

To address these research gaps, we selected game live streaming as a context to understand the affordance-based gratifications on the live streaming platforms, user engagement

behaviors, and the role of users' identification with live streamers and affiliated fans. This selection was motivated by the prominence of live gaming within many professional live streaming platforms such as Twitch.tv, Douyu, and Huya, as well as the entry of prominent tech giants such as Tencent and YouTube into the game live streaming industry, building their platforms like Tencent ESports and YouTube Game. Moreover, the live streaming of video games has significantly contributed to the accessibility and development of esports and the game industry (Johnson & Woodcock, 2019; Wohn & Freeman, 2020). It is our belief that by examining the relationship between platform affordability and user activities in the realm of game live streaming, both live streaming platforms and the game industries stand to benefit from valuable insights and understandings.

Through a survey involving a sample of 565 participants in mainland China, we investigated the relationship between affordance-based gratifications and the various layers of engagement within the context of game live streaming. Furthermore, the study aimed to elucidate the mediating influence exerted by users' identification with both the live streamer and the associated fan base. We found that different affordance-based gratifications can indeed impact different engaging behaviors, with interactivity functions emerging as particularly influential within the game live streaming industry. Furthermore, we discovered that user identification with the streamer and other fans plays a mediating role, effectively connecting affordance-based gratifications with user engagement.

2. Literature Review

2.1 Features of the Game Live Streaming Platforms as Social Media

The game live streaming platform serves as a public venue where streamers can broadcast real-time video footage of gameplay, while viewers can engage in simultaneous

discussions through a public chat channel (Hamilton et al., 2014).In accordance with McLuhan's conceptual framework (McLuhan, 1964), this platform can be characterized as both "hot" and "cool" media. Game graphics represent a form of hot media, featuring high fidelity but limited viewer participation, whereas the chat channel embodies cool media, exhibiting lower fidelity but encouraging active viewer engagement. Consequently, game live streaming platforms enable both spectating and participation, rekindling the communal spectating aspect reminiscent of arcade gaming within the context of online video game culture (Sjöblom & Hamari, 2017).

Hamilton et al. (2014) conducted an ethnographic investigation of the game live streaming platform Twitch, revealing that user interaction and participation in shared activities are prominent motivations for engagement with this platform. Similarly, Hilvert-Bruce et al. (2018) employed an online survey targeting Twitch users and found that social motives, such as a sense of community, social interaction, and the opportunity to meet new people, significantly predict engagement with live streaming. Collectively, these studies demonstrate that sociality plays a pivotal role in fostering participatory communities within live streaming platforms. Consequently, such sociality endows game live streaming platforms with the essential characteristics of social media platforms, which provide users with the means to connect, interact, share, express, and create content (Muntinga et al., 2011).

In comparison to other social media platforms, such as Facebook, Twitter, Instagram, and TikTok, live streaming platforms exhibit distinct features. While Facebook facilitates connection through photo and status sharing, Twitter enables interaction via text-based tweets, Instagram focuses on sharing photos and short videos with friends, and TikTok centers on the dissemination of short-form videos to followers (Meng & Leung, 2021; Stec, 2015), game live streaming platforms stand out due to their real-time video sharing capabilities and heightened

interactivity between streamers and their fans (Hilvert-Bruce et al., 2018). To comprehensively comprehend the motivations behind people's engagement with game live streaming platforms, it is imperative to comprehend both the manner in which individuals interact with these platforms and the accompanying features. This necessity serves as a segue into the subsequent section of the literature review.

2.2 User Engagement Behaviors on the Game Live Streaming Platforms

Public relations and social media campaign research (e.g., Kaur et al., 2019; Lim et al., 2015) have indicated that various message features elicit distinct social media engagement behaviors, which in turn reflect the cognitive or monetary efforts of social media users. For instance, Kim and Yang (2017) observed that different message features resulted in diverse behaviors: sensory and visual content stimulated liking, while rational and interactive content prompted commenting. These engagement behaviors entail varying levels of cognitive efforts, which in turn influence their weighting within the recommendation algorithms of social media platforms.

On the game live streaming platforms, the different engaging behaviors also influenced the recommendation logic and platform design. In the current study, it is crucial to classify user engagement behaviors on game live streaming platforms. We will examine six distinct engagement behaviors on these platforms, namely watching, liking, subscribing, sharing, creating, and gift-giving. Watching denotes the act of users viewing game live streaming content. Liking entails users clicking the thumb-up button to express their appreciation and enjoyment of the live streaming content. Subscribing refers to users following a streamer's account to stay updated on their content. Sharing involves users disseminating the live streaming content among their friends or on other social media platforms to increase its visibility. Creating encompasses

the generation of danmuku (live comments) and posting comments while watching the live streaming, both of which are significant aspects of contemporary live streaming culture. Gift-giving involves users bestowing virtual gifts upon live streamers during the live streaming session (Li & Peng, 2021; Zhang, 2022).

To classify the aforementioned engagement behaviors, we have adapted Muntinga et al.'s (2011) typology, which delineates three levels—consuming, contributing, and creating—to evaluate brand-related social media use. Consuming represents the minimum level of engagement, where users passively consume media content. Contributing involves user-to-content interactions (e.g., rating a product) and user-to-user interactions (e.g., engaging in conversations on a brand community forum). Creation represents the ultimate level, as it requires considerable effort from users to produce and publish content. Given that live streaming platforms rarely afford or users the right and ability to become streamers themselves, our study considers only the levels of consuming and contributing. We have categorized the range of engagement behaviors into two groups: primary engaging behaviors (watching, liking, and subscribing) and secondary engaging behaviors (sharing, creating, and gift-giving). The three primary engaging behaviors reflect passive consuming, as they involve less interaction compared to sharing and creating. By classifying gift-giving as a secondary engaging behavior, we posit that users invest greater monetary efforts into the platform through the act of giving virtual gifts to the streamer. Moreover, these gifts contribute to the profits of the live streaming platform, thus warranting a higher position compared to other engagement behaviors.

Having outlined the main outcome variables of the present study, we will now discuss the theoretical model employed in our research.

2.3 Affordance-based Gratifications and the Uses and Gratifications Theory

The uses and gratifications (U&G) theory posits that individuals have psychological and social needs that can be satisfied by using certain media (Katz et al., 1974). Originating from the mass communication era, the U&G theory standed out by emphasizing the concept of an "active audience" and focusing on the psychological and social perspectives of audiences. As we transitioned into the Web 2.0 era, internet audiences now actively use and interact with digital media, leading to their characterization as "users." In this context, social and psychological needs are no longer the sole determinants influencing gratification derived from media use; the affordances of digital technologies also shape our media usage experiences (Shyam, 2008). Building upon this notion, Sundar and Limperos (2013) proposed U&G theory 2.0, which introduces affordances of media technology—interface features that suggest how users can interact with the interface and contribute to content construction—as novel sources of media gratifications.

Previously, the psychological, social, and technical determinants of the U&G theory have been widely applied to various applications and platforms of digital media, including Instagram (Chen et al., 2022), TikTok (Meng & Leung, 2021), mobile social games (Chen & Leung, 2016), and dating apps (Sumter et al., 2017). In the context of game live-streaming platforms, Sjöblom and Hamari (2017) examined individuals' cognitive, affective, personal integrative, social integrative, and tension motivations for watching video game live-streams online. They found that all five classes of gratification were positively associated with the number of hours and streamers that individual users watched, with a focus on personal integrative gratifications and tension release. Tang et al. (2021) explored gender differences in motivations for esports viewing, noting that women viewed esports from the perspective of escapism, while men viewed

it for entertainment. However, the perspective of affordance-based gratifications remains largely unexplored, creating a significant gap in the era of live streaming technical platforms. Therefore, it is essential to apply affordance-based gratifications to the context of game live-streaming platforms.

Modality-based gratifications derive from multiple modalities (e.g., text, pictures, audio, video) used to present media content, appealing to different aspects of the human perceptual system (Sundar & Limperos, 2013). Game live streaming shows several modalities, such as visual appeals (e.g., live video content of gameplay and a video feed of streamers themselves in real life) and textual appeal (e.g., spectators' discussion with text on chatbox) (Hamilton et al., 2014). These modalities allow users to immerse themselves in places they cannot physically experience and to feel like they are engaging in face-to-face communication, satisfying their needs for realism and a sense of presence.

Agency-based gratifications allow users to be the sources of information and facilitate two-way communication between content creators and viewers (Sundar & Limperos, 2013). On game live-streaming platforms, chat rooms are embedded in each live streaming channel, enabling users to express their ideas and receive responses from streamers and other viewers. Additionally, real-time scrolling comments across the screen (F. Zhou et al., 2019; J. Zhou et al., 2019) further enhance the participatory nature of these communities, greatly supporting and encouraging user-generated content.

Interactivity-based gratifications are associated with features that allow users to make real-time changes to the content (Sundar & Limperos, 2013). These features are highly utilitarian-oriented, requiring media interfaces to provide a high level of activity (e.g., hyperlinks) and be highly responsive to user interactions. Game live streaming platforms have

various functions that enable spectators to interact with the digital system, streamers, and other users. Two examples illustrate this in the context of game live streaming platforms. Firstly, users are not passive audiences; they can purchase virtual gifts embedded in the platform (e.g., a loving heart, rocket) to show their appreciation and support for the streamers. Moreover, the platform recommends popular accounts on the homepage, and if users know how to indicate their disinterest in certain content, they feel a sense of agency and control over the system. Additionally, as the recommended content aligns with a user's preferences, they perceive the system as interactive.

Navigability-based gratifications refer to the enjoyment of navigating through Internet-based media (Sundar & Limperos, 2013). To enhance navigability, a platform should provide abundant information for users to browse and create a sense of fun and exploration. Additionally, it should incorporate functions such as searching and algorithmic recommendations to cater to users' information-seeking needs.

In this section, we introduced the U&G theory and discussed the concept of four affordance-based gratifications, explaining how game live streaming platforms offer these affordances. Affordance-based gratifications serve as vital predictors of user engagement behaviors in our study. In the next section, we will introduce the social media engagement theory, which will assist in the development of our research model.

2.4 The Present Study

2.4.1 Social Media Engagement Theory

The present study adopts the theoretical framework of the social media engagement theory, which explains how user experiences influence subsequent engagement and usage behaviors on social media platforms (Di Gangi & Wasko, 2016). The SME theory considers user

experiences as a combination of social interaction and technical features on social media platforms, which collectively influence user engagement. Higher engagement on social media is regarded as a crucial factor in the SME theory as it is linked to continued platform usage (Kim & Yang, 2017; Pentina et al., 2018). Previous studies have applied the SME theory to various social media behaviors, such as investigating continuance intention to use danmaku video-sharing platforms (Xiang & Chae, 2022) and virtual meeting platforms (Al-Sharafi et al., 2022). However, while the original theory encompasses both social perspectives and technical features in defining user experiences, prior studies have primarily focused on social interaction experiences (e.g., Al-Sharafi et al., 2022; Pentina et al., 2018; Xiang & Chae, 2022), overlooking the role of technical user experiences. Some studies attempted to connect gratifications and user engagement by considering medium features but still viewed the platform as a container for content rather than emphasizing the medium technology itself, seeking to establish a connection between content and user engagement (Dolan et al., 2016).

In this study, we conceptualize and operationalize variables differently. For user experience, we emphasize the vital role played by the affordances of game live streaming platforms in shaping users' experiences. We aim to investigate how these affordances influence user engagement and platform usage. In terms of user engagement, we examine a diverse range of behaviors, including commenting, liking, sharing, and gift-giving, and categorize them based on their level of engagement. Through this approach, we aim to explore how different affordances trigger varying levels of engagement on digital platforms.

2.4.2 Social Identity Theory

Social identity theory suggests that individuals have a perceived identity within their respective groups (Tajfel & Turner, 1979). This identity enhances their commitment to the group

and subsequently influences their supportive behaviors toward the group (Ashforth et al., 2008). Within the context of game live streaming, a game community exists where individuals can identify with both prominent individuals (streamers) and the overall group (Badrinarayanan et al., 2015; Hu et al., 2017). The game live streaming platforms provide participatory communities for streamers and spectators, and due to the platform's streamer-centered design, user identification on these platforms comprises identification with the streamer and identification with other fans of the streamer.

In game live streaming, users belonging to the same fan group of a particular streamer can interact with each other through text-based dialogues and engage with the streamer by giving virtual gifts (Hamilton et al., 2014). This process enhances both the users' identification with the streamer and their identification with other audience members. Previous studies have demonstrated that identification with a group can influence supportive behaviors in virtual online communities, including game live streaming communities (Badrinarayanan et al., 2015; Hu et al., 2017).

2.4.3 Hypotheses

The relationship between user experience and different ways of use. Drawing upon the theory of Uses and Gratifications (U&G), individuals actively choose media that fulfill their specific needs. In the context of game live streaming platforms, the U&G 2.0 theory emphasizes the significance of technological features in satisfying user needs and generating novel gratifications. Therefore, if the technical features of a game live streaming platform effectively meet users' needs, particularly the four types of affordance-based gratifications identified in our study, users are more likely to remain engaged on the platform and participate in various activities. Thus, we can infer that:

H1(a): Modality-based gratifications are positively associated with the frequency of primary engaging behaviors.

H1(b): Modality-based gratifications are positively associated with the frequency of secondary engaging behaviors.

H2(a): Angency-based gratifications are positively associated with the frequency of primary engaging behaviors.

H2(b): Angency-based gratifications are positively associated with the frequency of secondary engaging behaviors.

H3(a): Interactivity-based gratifications are positively associated with the frequency of primary engaging behaviors.

H3(b): Interactivity-based gratifications are positively associated with the frequency of secondary engaging behaviors.

H4(a): Navigability-based gratifications are positively associated with the frequency of primary engaging behaviors.

H4(b): Navigability-based gratifications are positively associated with the frequency of secondary engaging behaviors.

The relationship between user identification and different ways of use. It is observed that individuals tend to maintain reciprocal relationships with both identified individuals and communities (Badrinarayanan et al., 2015; Hu et al., 2017). Consequently, if a user strongly identifies with a streamer, they are more inclined to watch their live streams and engage with them through various interactive behaviors. This engagement serves to foster and sustain the reciprocal relationship between the user and the streamer. A similar rationale can be applied to

the relationship between group identification and the utilization of game live streaming platforms. Hence, we propose that:

H5(a): Greater user identification leads to a higher frequency of primary engaging behaviors.

H5(b): Greater user identification leads to a higher frequency of secondary engaging behaviors.

The relationship between user experience and user identification. We contend that the presence of diverse affordance-based gratifications can enhance the connection between streamers and spectators for several reasons. Firstly, the utilization of different modalities allows streamers to be visually presented in various ways, showcasing their gameplay and personal interactions. This immersive and realistic experience fosters a sense of face-to-face engagement, thereby strengthening the user's identification with the streamer. Secondly, when users are empowered to generate content and actively communicate with the streamers (agency-based gratifications), as well as freely navigate information related to the streamers (navigability-based gratifications), they gain deeper insights into the streamers' personalities, attitudes, and beliefs. This increased understanding further contributes to the user's identification with the streamers. Thirdly, interactivity-based gratifications serve as technical support for the other three affordance-based gratifications. A well-designed interface that allows users to interact with the system and ensures responsiveness enhances the overall user experience, reinforcing the impact of other affordances. Consequently, these technical features play a pivotal role in fostering users' attachment to streamers. Similar reasoning can be applied to the relationship among users on game live streaming platforms, where different technical features facilitate communication and community building among users. Based on these premises, we infer that:

H6(a): Modality-based gratifications are positively associated with user identification.

H6(b): Angency-based gratifications are positively associated with user identification.

H6(c): Interactivity-based gratifications are positively associated with user identification.

H6(d): Navigability-based gratifications are positively associated with user identification.

The research model depicting these relationships is illustrated in Figure 1. With the research model established, we will proceed to introduce our research methodology and measurement in the subsequent section.

3. Method

3.1 Participants

The main focus of this study is to explore the relationship between four types of affordance-based gratifications and different levels of engagement. A pilot survey was conducted in February 2023, involving 91 students from a college in Guangxi province, China. Convenience sampling and snowball sampling methods were used to recruit participants, aiming to provide a preliminary understanding of the relationship and lay the foundation for refining the statements. The pilot survey was conducted in Chinese. From the pilot study, it was found that different affordance-based gratifications characterize different consumer behaviors on game live-streaming platforms, and these specific relationships would be further explored in the formal study. The mediating variables between the influence of affordance-based gratification on engaging behaviors would be considered in the formal study.

In May 2023, a survey was conducted through an online survey platform named Credamo, which is an equivalent platform of MTurk in providing research survey and experiments services in Mainland China with a sample database of over 3 million participants (Credamo, n.d.) and has been widely used by communication scholars (e.g., Yang & Kim, 2023;

Zheng, 2023). The survey began with a screening question, "Have you watched game live streams in the past three months?" Participants who answered "no" were automatically excluded. We randomly sent the online survey to the participants on Credamo using the WeChat database and received a total of 600 responses. We further cleaned the dataset by deleting those who failed the attention check question or finished the entire survey within 3 minutes. We finally obtained 565 valid questionnaires from 28 provincial administrative regions in mainland China. Each respondent received a reward of ¥3 (approximately $0.5).

The demographic information of the sample is shown in Table 1. More than half of the participants were female (61.2%). Around 52.8% were between the ages of 21 and 30, and 42.1% between 31 to 40. In addition, 74.9% of them held a bachelor degree. Finally, more than half of the participants (54.9%) had a monthly income of more than 8,000 chinese yuan. In comparison to the 50th statistical report on Chinese Internet users published by CNNIC (2022), the participants in this study were primarily concentrated in the age groups of 21–30 and 31–40, with fewer respondents above the age of 40. Moreover, this study had a higher percentage of participants with a bachelor's degree or higher education. This distribution difference can be explained by the sociodemographic factor related to the early adopters in empirical studies about the diffusion of innovation theory, where young people and people with higher education level tend to adopt new things (Dedehayir et al., 2017). Since the study specifically targeted participants who had watched the game live streaming, which is considered a new and trendy phenomenon in China, it was more likely to attract a sample consisting of younger and more educated individuals.

3.2 Measures

In addition to the screening question and demographic measurements, the survey included engaging behaviors, four types of affordance-based gratifications, and user identification on the live streaming platform. All measurement items were derived from previous studies and modified to suit the context of game live streaming. All variables were assessed using a seven-point Likert scale. The survey statements were originally in Chinese and were translated into English for presentation in Table 2. After validating and ensuring the reliability of the scale, we believe that this measurement can be adapted and replicated in future studies investigating live streaming platforms and consumer behaviors related to game live streaming.

Engaging behaviors. User engagement behaviors on game live streaming platforms are similar to those on other social media platforms. We adopted Kim and Yang's (2017) classification of user engagement on Facebook and created our scale to measure engagement behaviors on game live streaming platforms. The scale included the following actions: watching, liking, subscribing, sharing, creating, and gift-giving. It’s quite straightforward to understand watching, liking, and subscribing, but we need to clarify about the sharing, creating, and gift-giving behaviors. Sharing refers to users sharing the live streaming content with their friends or on other social media platforms to increase its visibility (Kim & Yang, 2017). Creating involves both creating danmuku (live comments) and posting comments while watching the live streaming, which are both significant aspects of today's live streaming culture. Gift-giving refers to the act of giving virtual gifts to the live streamers during the live streaming session (Li & Peng, 2021; Zhang, 2022). To differentiate the level of engagement, we categorized the range of engaging behaviors into two groups: primary engaging behaviors (watching, liking, and subscribing) and secondary engaging behaviors (sharing, creating, and gift-giving). We classified

sharing, creating, and gift-giving as secondary engagement behaviors (M = 4.45, SD = 1.26, α = .81) because they involved more cognitive or monetary efforts that required more investment compared to the primary engaging behaviors (M = 5.11, SD = .98, α = .76) (Kim & Yang, 2017; Zhang, 2022).

Affordance-based gratification. We aimed to measure four types of affordance-based gratification on game live streaming platforms: modality-based gratification, agency-based gratification, interactivity-based gratification, and navigability-based gratification. All measurement items were adapted from Sundar and Limperos' (2013) and modified to fit the context of game live streaming. There were five items to measure modality-based gratification (M = 5.77, SD = .60, α = .72), seven items for agency-based gratification (M = 5.77, SD = .57, α = .71), seven items for interactivity-based graitifcation (M = 5.70, SD = .68, α = .81), and navigability-based gratification (M = 5.92, SD = .52, α = .72).

User identification. The measurement of user identification consisted of their identification with the live streamer and their identification with the game fan group (Hu et al., 2017; Yoshida et al., 2015). To measure identification with the live streamer, items focused on affiliation with the streamer, while for identification with the group, items emphasized affiliation with other fans. The seven items were combined to create the user identification variable (M = 5.64, SD = .70, α = .78).

3.3 Data Analysis

Multiple regression analysis was employed to test research hypotheses, explore the direct and indirect associations between variables, and examine research questions. We controlled for age, gender, education, and monthly income while performing the multiple regression analysis,

as recommended by prior research (e.g., Zheng et al., 2023). All data analyses were conducted in SPSS 26.0.

4. Results

The results of the hypothesis testing are presented in Table 4. The full model explained 50.5% of the variance in the primary engaging behaviors and 47.2% in the secondary engaging behaviors. We report their associations as follows. As illustrated by Figure 2, modality-based gratifications directly and positively correlated with primary engaging behaviors ($\beta = .14$, $p < .01$). As such, H1(a) was supported. However, the relationship between modality-based gratifications and primary engaging behaviors was not statistically significant ($\beta = .05$, $p > .05$). H1(b) was unsupported. H2(a) and H2(b) were not supported either: The coefficient between agency-based gratifications and primary engaging behaviors, and the coefficient between agency-based gratification and secondary engaging behaviors, were either not statistically significant ($\beta = -.42$, $p > .05$; $\beta = -.02$, $p > .05$). Conversely, the H3(a) and H3(b) were both supported: The coefficient between interactivity-based gratifications and primary engaging behaviors, and the coefficient between interactivity-based gratification and secondary engaging behaviors, were both statistically significant ($\beta = .24$, $p < .001$; $\beta = .38$, $p < .001$). For the navigability-based gratifications, there is no significant relationship between navigability-based gratifications and primary engaging behaviors ($\beta = .00$, $p > .05$). To our surprise, the relationship between navigability-based gratifications and secondary engaging behaviors is contrary to our predictions, indicating that navigability-based gratifications have a negative impact on secondary engaging behaviors ($\beta = -.12$, $p < .01$). For the relationship between user identification and the two layers of engaging behaviors, H5(a) and H5(b) were both supported ($\beta = .37$, $p < .001$; $\beta = .27$, $p < .001$). For the relationship between the four affordance-based gratifications and user

identification, H6(a), H6(b), H6(c), and H6(d) were all supported ($\beta = .21$, $p < .001$; $\beta = .17$, $p < .001$; $\beta = .34$, $p < .001$; $\beta = .13$, $p < .01$).

5. Discussion

5.1 Summary of key findings

Through a survey involving 565 valid participants, we obtained significant results that contribute to our understanding of the relationships between affordance-based gratifications, user identification, and user engagement. Firstly, the high explanatory power of the models for primary engaging behaviors and secondary engaging behaviors ($R^2 = 50.5\%$; $R^2 = 47.2\%$) indicates that affordance-based gratifications and user identification are crucial variables influencing user engagement. These findings provide strong evidence for the inclusion of key variables in our study and serve as the foundation for further analysis.

Regarding the direct relationship between affordance-based gratifications and different layers of engaging behaviors, our initial hypothesis suggested a positive impact on both types of engagement behaviors. However, considering the distinct characteristics of the four types of affordance-based gratifications and the cognitive and monetary efforts involved in each layer of engagement, the results of our hypothesis testing are reasonable. This highlights the importance of not generalizing the technological affordance features of a platform, but instead focusing on the specific characteristics of each affordance dimension.

Specifically, modality-based gratifications had a positive influence on primary engaging behaviors but did not significantly impact secondary engaging behaviors. Agency-based gratifications did not significantly influence either layer of engagement. Interactivity-based gratifications positively and significantly influenced both layers of engagement. However,

navigability-based gratifications had a negative impact on secondary engaging behaviors and did not significantly influence primary engaging behaviors.

To understand the differences in the impact of affordance-based gratifications on engaging behaviors, we refer to Shyam's (2008) definition of affordances in technology and Sundar and Limperos' (2013) original research on uses and gratifications variables. Modality-based gratifications represent basic gratifications that can be fulfilled through the multimedia features of platforms, such as video content feeds and text chatboxes on game live streaming platforms. Satisfying these basic gratifications can increase primary engaging behaviors, but it may be challenging to increase engagement that requires more cognitive and monetary efforts. Interactivity-based gratifications, which involve user interactions with the streamer through interactive buttons on the game live streaming platforms, enhance user activity and perceived control over the platform, leading to increased engagement in both primary and secondary behaviors. Navigability-based gratifications, on the other hand, focus more on browsing and exploration, which may not align well with the design of live streaming platforms that encourage users to stick with one streamer rather than switch between multiple streamers. Hence, navigability-based gratifications are not significantly related to primary engaging behaviors and even negatively associated with secondary engaging behaviors, as repeatedly switching streamers may discourage users from investing significant efforts in a single live stream.

One remaining question is the weak relationship between agency-based gratifications and both layers of engagement. We believe this can be better understood by considering the strong mediating role of user identification in the relationship between affordance-based gratifications and engagement. The agency-based gratifications focused on the opinion sharing afforded to the

users, however, without the huge identification with the group, they were not even willing to share their opinions. This called our attention to the role of the streamer.

As depicted in Figure 2, user identification plays a significant mediating role by bridging the gap between the four dimensions of affordance-based gratifications and the two levels of engagement, even when some of them were not directly related. We believe that the impact of user identification can be explained by the social identity theory, which suggests that group experiences can enhance individuals' identification with a specific group and subsequently promote their supportive behaviors within that group (Ashforth et al., 2008). From the perspective of social media engagement theory, we view affordance-based gratifications as technical experiences that hold the same level of importance as social experiences when using social media platforms (Di Gangi & Wasko, 2016). Just like social experiences can influence user identification (Badrinarayanan et al., 2015; Hu et al., 2017), technical experiences also have an impact on user identification. Moreover, the engagement behaviors observed, such as watching, subscribing, liking, sharing, commenting, and gift-giving, can be seen as forms of supportive behaviors exhibited by users. Therefore, users are motivated to employ these behaviors to show support for the streamer and the fan group they belong to.

5.2 Research and Practical Implications

It is important to emphasize that our research represents one of the pioneering efforts in connecting affordance-based gratifications with engaging behaviors within the context of live streaming platforms, utilizing both the uses and gratifications theory and the social media engagement model. This research provides powerful evidence that not only social and psychological experiences influence user engagement but also technical experiences. It

highlights the need for a socio-technological perspective and calls for attention to the influence of medium technology on users' engagement.

While the variable of user identification has been previously employed as a mediating variable between user experiences and social media use (e.g., Hu et al., 2017), this study addresses the gap where technical experiences have often been neglected in identification research. The positive relationship between affordance-based gratifications and user identification demonstrates that users can acquire group bonds not only through social and psychological connections but also through technical means.

For practitioners, especially those in the game live streaming industry, the different influences of the four affordance-based gratifications on the different levels of engagement can provide valuable insights for the designers and developers of live streaming platforms. Currently, the basic infrastructure of video-sharing and chat boxes on game live streaming platforms are sufficient to enhance primary engagement, such as increasing watching, liking, and subscriptions. However, to promote secondary engagement, which is crucial for platform profitability and visibility, attention should be focused on enhancing interactivity between the streamer and the user by incorporating interactive buttons on the live streaming page. Additionally, to increase engagement, game live streaming platforms should leverage the role of streamers to foster their fan base, thereby promoting community building and user engagement. Currently, game live streaming platforms have not implemented uploader encouragement programs similar to those employed by platforms like Bilibili in China (Xu, 2023). The creator encouragement plan implemented by Bilibili satisfied the avid fan base and cultivated a cultural identity that engages users on the platform (Shen, 2021; Xu, 2023). Our research emphasizes that

creators also play an important role in game live streaming platforms, and practitioners should enhance the role of streamers by encouraging high-quality content creation.

5.3 Limitations and Future Directions

It is crucial to acknowledge the limitations of this study. Firstly, in terms of engaging behaviors, our focus was primarily on the prominent and observable behaviors on game live streaming platforms. However, as we conclude this manuscript, we recognize that more profound and nuanced engaging behaviors are emerging on these platforms, such as the formation of dedicated fan groups like the "Fish Bar" on Douyu, catering to highly devoted fans. A panel survey alone may not provide detailed insights into these highly involved forms of engagement, highlighting the need for future studies to explore these behaviors further.

Additionally, it is worth considering the influence of game genres on game live streaming consumption, as suggested by previous studies (e.g., Ma et al., 2021). Future research could delve into the motivations and preferences associated with specific game genres to provide a more comprehensive understanding of engagement on game live streaming platforms.

Lastly, it is important to note that this study was conducted within the context of Chinese game live streaming. Therefore, caution should be exercised when generalizing these results to the global game live streaming industry and platforms. Further research from a socio-techno perspective within various cultural contexts is necessary to form a more comprehensive understanding of the topic.

6. Conclusion

The increasing popularity of game live streaming platforms has captured the attention of scholars seeking to understand the reasons and mechanisms behind user engagement. However, most previous studies have primarily focused on psychological and social experiences in

addressing this question. Recognizing the significance of media technology in shaping engagement on social media platforms, this study integrated the uses and gratifications 2.0 theory, social media engagement theory, and social identity theory to investigate the direct and indirect relationships between affordance-based gratifications and different engagement behaviors, as well as the mediating role of user identity.

Our findings shed light on the impact of different affordance-based gratifications on various engaging behaviors, with a particular emphasis on the crucial role of interactivity in driving higher levels of engagement on game live streaming platforms. Moreover, this study highlights the importance of user identity within the chain of influence, underscoring the need for increased attention to streamers in the game live streaming industry. In an era increasingly reliant on platform technology, it is essential to comprehensively consider the relationship among technical affordances, the individuals who wield communication power, and the users themselves. This research represents a valuable attempt in this direction.

References

Al-Sharafi, M. A., Al-Emran, M., Arpaci, I., Marques, G., Namoun, A., & Iahad, N. A. (2022). Examining the impact of psychological, social, and quality factors on the continuous intention to use virtual meeting platforms during and beyond COVID-19 pandemic: A hybrid SEM-ANN approach. *International Journal of Human–Computer Interaction*, 1–13. doi:10.1080/10447318.2022.2084036

Ashforth, B. E., Harrison, S. H., & Corley, K. G. (2008). Identification in organizations: An examination of four fundamental questions. *Journal of Management, 34*(3), 325–374. doi:10.1177/0149206308316059

Badrinarayanan, V. A., Sierra, J. J., & Martin, K. M. (2015). A dual identification framework of online multiplayer video games: The case of massively multiplayer online role playing games (MMORPGs). *Journal of Business Research, 68*(5), 1045–1052. doi:10.1016/j.jbusres.2014.10.006

Chen, C., Cohen, O., & Sundar, S. S. (2022). Differentiating Problematic from Habitual Instagram Use: A Uses and Grats 2.0 Perspective. *Social Media + Society*, *8*(3), 205630512211163. doi:10.1177/20563051221116339

Chen, C., & Leung, L. (2016). Are you addicted to Candy Crush Saga? An exploratory study linking psychological factors to mobile social game addiction. *Telematics and Informatics*, *33*(4), 1155–1166. doi:10.1016/j.tele.2015.11.005

Cho, M., Schweickart, T., & Haase, A. (2014). Public engagement with nonprofit organizations on Facebook. *Public Relations Review*, *40*(3), 565–567. doi:10.1016/j.pubrev.2014.01.008

CNNIC (2022, August). *The 50th statistical report on China's Internet development.* China Internet Network Information Center. https://www.cnnic.com.cn/IDR/ReportDownloads/202212/P020221209344717199824.pdf

Credamo. (n.d.). Professional survey & experimental tool. https://www.credamo.world/#/

Di Gangi, P. M., & Wasko, M. M. (2016). Social media engagement theory: Exploring the influence of user engagement on social media usage. *Journal of Organizational and End User Computing*, *28*(2), 53–73. doi:10.4018/JOEUC.2016040104

Dedehayir, O., Ortt, R. J., Riverola, C., & Miralles, F. (2017). Innovators and early adopters in the diffusion of innovations: A literature review. *International Journal of Innovation Management, 21*(9), 85–115. doi:10.1142/S1363919617400102

Dolan, R., Conduit, J., Fahy, J., & Goodman, S. (2016). Social media engagement behaviour: A uses and gratifications perspective. *Journal of Strategic Marketing, 24*(3-4), 261–277. doi:10.1080/0965254X.2015.1095222

Halpern, D., & Gibbs, J. (2013). Social media as a catalyst for online deliberation? Exploring the affordances of Facebook and YouTube for political expression. *Computers in Human Behavior, 29*(3), 1159–1168. doi:10.1016/j.chb.2012.10.008

Hamilton, W. A., Garretson, O., & Kerne, A. (2014). Streaming on twitch: Fostering participatory communities of play within live mixed media. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, 1315–1324. doi:10.1145/2556288.2557048

Hilvert-Bruce, Z., Neill, J. T., Sjöblom, M., & Hamari, J. (2018). Social motivations of live-streaming viewer engagement on Twitch. *Computers in Human Behavior, 84*(2018), 58–67. doi:10.1016/j.chb.2018.02.013

Hu, M., Zhang, M., & Wang, Y. (2017). Why do audiences choose to keep watching on live video streaming platforms? An explanation of dual identification framework. *Computers in Human Behavior*, *75*, 594–606. doi:10.1016/j.chb.2017.06.006

Johnson, M. R., & Woodcock, J. (2019). The impacts of live streaming and Twitch. tv on the video game industry. *Media, Culture & Society, 41*(5), 670–688. doi:10.1177/0163443718818363

Katz, E., Blumler, J., & Gurevitch, M. (1974). Utilization of mass communication by the individual. In J. Blumler & E. Katz (Eds.), *The Uses of Mass Communications: Current Perspectives on Gratifications Research*. Sage Publications.

Kaun, A., & Stiernstedt, F. (2014). Facebook time: Technological and institutional affordances for media memories. *New Media & Society, 16*(7), 1154–1168. doi:10.1177/1461444814544001

Kaur, W., Balakrishnan, V., Rana, O., & Sinniah, A. (2019). Liking, sharing, commenting and reacting on Facebook: User behaviors' impact on sentiment intensity. *Telematics and Informatics*, *39*, 25–36. doi:10.1016/j.tele.2018.12.005

Kim, C., & Yang, S. U. (2017). Like, comment, and share on Facebook: How each behavior differs from the other. *Public Relations Review, 43*(2), 441–449. doi:10.1016/j.pubrev.2017.02.006

Li, Y., & Guo, Y. (2021). Virtual gifting and danmaku: What motivates people to interact in game live streaming? *Telematics and Informatics, 62*(2021), 101624. doi:10.1016/j.tele.2021.101624

Li, Y., & Peng, Y. (2021). What drives gift-giving intention in live streaming? The perspectives of emotional attachment and flow experience. *International Journal of Human–Computer Interaction, 37*(14), 1317–1329. doi:10.1080/10447318.2021.1885224

Lim, J. S., Hwang, Y., Kim, S., & Biocca, F. A. (2015). How social media engagement leads to sports channel loyalty: Mediating roles of social presence and channel commitment. *Computers in Human Behavior*, *46*, 158–167. doi:10.1016/j.chb.2015.01.013

Ma, S. C., Byon, K. K., Jang, W., Ma, S. M., & Huang, T. N. (2021). Esports spectating motives and streaming consumption: Moderating effect of game genres and live-streaming types. *Sustainability, 13*(8), 4164. doi:10.3390/su13084164

McLuhan, M. (1964). *Understanding media: The extensions of man.* University of Toronto Press.

Meng, K. S., & Leung, L. (2021). Factors influencing TikTok engagement behaviors in China: An examination of gratifications sought, narcissism, and the Big Five personality traits. *Telecommunications Policy, 45*(7), 102172. doi:10.1016/j.telpol.2021.102172

Muntinga, D. G., Moorman, M., & Smit, E. G. (2011). Introducing COBRAs: Exploring motivations for brand-related social media use. *International Journal of Advertising, 30*(1), 13–46. doi:10.2501/IJA-30-1-013-046

Nagy, P., & Neff, G. (2015). Imagined affordance: Reconstructing a keyword for communication theory. *Social Media+ Society, 1*(2),1–9. doi: 10.1177/2056305115603385

Pentina, I., Guilloux, V., & Micu, A. C. (2018). Exploring social media engagement behaviors in the context of luxury brands. *Journal of Advertising, 47*(1), 55–69. doi:10.1080/00913367.2017.1405756

Ruggiero, T. E. (2000). Uses and gratifications theory in the 21st century. *Mass Communication & Society, 3*(1), 3–37. doi:10.1207/S15327825MCS0301_02

Schultz, F., Utz, S., & Göritz, A. (2011). Is the medium the message? Perceptions of and reactions to crisis communication via twitter, blogs and traditional media. *Public Relations Review, 37*(1), 20–27. doi:10.1016/j.pubrev.2010.12.001

Shen, X. (2021, Mar 1). Bilibili is transforming into China's YouTube as dedicated 'uploaders' look beyond niche anime, comics and games. *South China Morning Post.* https://www.scmp.com/tech/big-tech/article/3123354/bilibili-transforming-chinas-youtube-dedicated-uploaders-look-beyond

Shyam, S. (2008). The MAIN model: A heuristic approach to understanding technology effects on credibility. In M. J. Metzger & A. J. Flanagin (Eds.), *Digital media, youth, and credibility*. MIT Press.

Sjöblom, M., & Hamari, J. (2017). Why do people watch others play video games? An empirical study on the motivations of Twitch users. *Computers in Human Behavior*, *75*, 985–996. doi:10.1016/j.chb.2016.10.019

Stec, C. (2015). *Social media definitions: The ultimate glossary of terms you should know.* Retrieved from https://blog.hubspot.com/marketing/social-media-terms

Sumter, S. R., Vandenbosch, L., & Ligtenberg, L. (2017). Love me Tinder: Untangling emerging adults' motivations for using the dating application Tinder. *Telematics and Informatics*, *34*(1), 67–78. doi:10.1016/j.tele.2016.04.009

Sundar, S. S., & Limperos, A. M. (2013). Uses and grats 2.0: New gratifications for new media. *Journal of Broadcasting & Electronic Media, 57*(4), 504–525. doi:10.1080/08838151.2013.845827

Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict. In W. G. Austin & S. Worschel (Eds), *The social psychology of intergroup relations* (pp. 56–65). Brooks/Cole.

Tang, T., Cooper, R., & Kucek, J. (2021). Gendered Esports: Predicting why men and women play and watch Esports games. *Journal of Broadcasting & Electronic Media*, *65*(3), 336–356. doi:10.1080/08838151.2021.1958815

Wohn, D. Y., & Freeman, G. (2020). Live streaming, playing, and money spending behaviors in eSports. *Games and Culture, 15*(1), 73–88. doi:10.1177/1555412019859184

Woodcock, J., & Johnson, M. R. (2019). The affective labor and performance of live streaming on Twitch. tv. *Television & New Media, 20*(8), 813–823. doi:10.1177/1527476419851077

Xiang, Y., & Chae, S. W. (2022). Influence of perceived interactivity on continuous use intentions on the danmaku video sharing platform: Belongingness perspective. *International Journal of Human–Computer Interaction*, *38*(6), 573–593. doi:10.1080/10447318.2021.1952803

Xu, W. (2023). Bilibili video streaming platform: Community culture identity vs. commercial culture. In Y. Elhaoussine & L. Wang (Eds)., *Cases on social justice in China and perspectives on Chinese brands* (pp. 237–250). IGI Global.

Yang, Y., & Kim, Y. (2023). Integrating the theory of planned behavior and bonding social capital to examine Chinese women's tampon use intentions. *Health Communication, 38*(3), 575–584. doi:10.1080/10410236.2021.1962586

Yoshida, M., Heere, B., & Gordon, B. (2015). Predicting behavioral loyalty through community: Why other fans are more important than our own intentions, our satisfaction, and the team itself. *Journal of Sport Management, 29*(3), 318–333. doi:10.1123/jsm.2013-0306

Zhang, G., & Hjorth, L. (2019). Live-streaming, games and politics of gender performance: The case of Nüzhubo in China. *Convergence, 25*(5-6), 807–825. doi:10.1177/1354856517738160

Zhang, W. (2022). Understanding gift-giving in game live streaming on Douyu: An evaluation of PSR/social presence. *Frontiers in Psychology, 13*, 953484. doi:10.3389/fpsyg.2022.953484

Zheng, H., Wang, X., & Huang, Y. H. (2023). Fake news in a time of plague: Exploring individuals' online information management in the COVID-19 era. *Computers in Human Behavior, 146*(2023), 107790. doi:10.1016/j.chb.2023.107790

Zheng, Q. (2023). Restoring trust through transparency: Examining the effects of transparency strategies on police crisis communication in Mainland China. *Public Relations Review, 49*(2), 102296. doi:10.1016/j.pubrev.2023.102296

Zhou, F., Chen, L., & Su, Q. (2019). Understanding the impact of social distance on users' broadcasting intention on live streaming platforms: A lens of the challenge-hindrance stress perspective. *Telematics and Informatics*, *41*, 46–54. doi:10.1016/j.tele.2019.03.002

Zhou, J., Zhou, J., Ding, Y., & Wang, H. (2019). The magic of danmaku: A social interaction perspective of gift sending on live streaming platforms. *Electronic Commerce Research and Applications*, *34*, 100815. doi:10.1016/j.elerap.2018.11.002

Zhou, Y., & Pun, N. (2022). Affording worker solidarity in motion: Theorising the intersection between social media and agential practices in the platform economy. *New Media & Society, 00*(0), 1–19. doi:10.1177/14614448221130474

Appendix

Figure 1. The hypothesized model

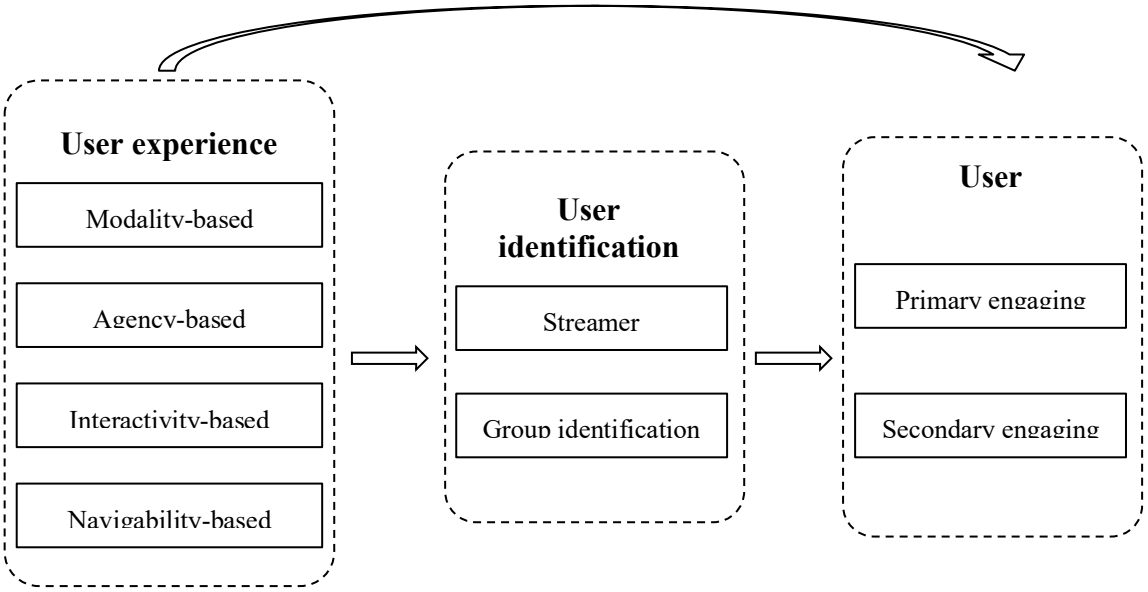
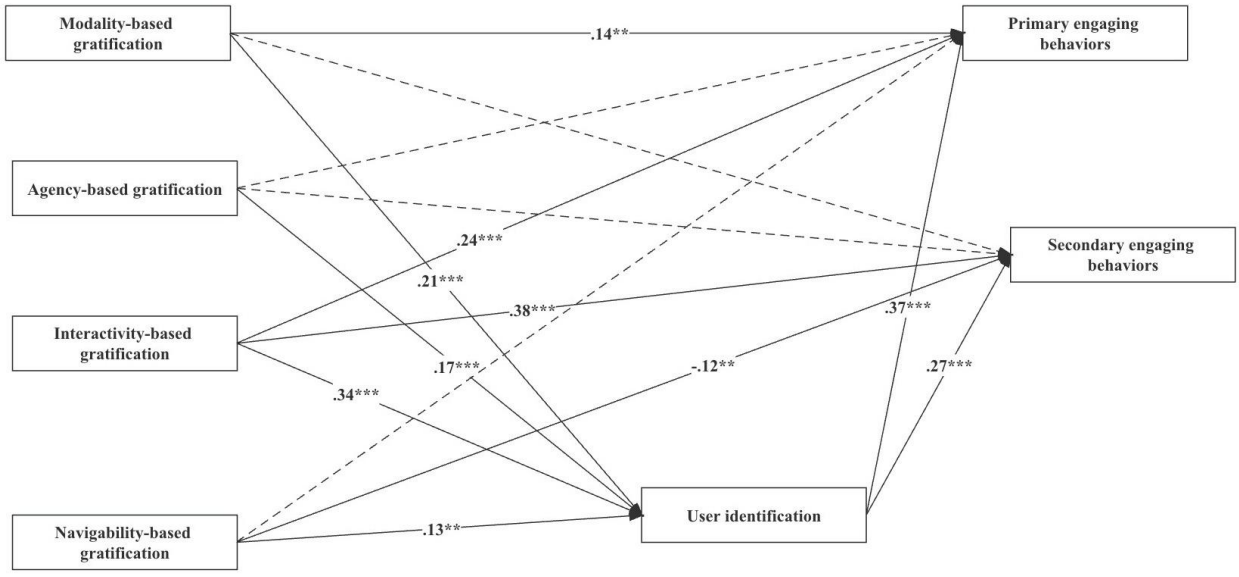


Figure 2. Results of multiple regression analysis.



*Note: *p < .05; **p < .01; ***p < .001. All coefficients in the figure are standardized. All non-significant relationships are represented by dashed lines.*

Table 1. Demographic characteristics of respondents (N = 565).

Measure	Item	Percentage	Mean	Median
Gender	Male	38.8%		
	Female	61.2%		
Age	20 or less	3.0%	29.19	30.00
	21–30	52.8%		
	31–40	42.1%		
	41–50	2.1%		
Education	High school or less	1.4%		
	Associate	4.2%		
	Bachelor	74.9%		
	Post-graduate	19.5%		
Monthly income	¥2,000 or less	8.8%		
	¥2,001 to ¥4,000	9.0%		
	¥4,001 to ¥6,000	12.0%		
	¥6,001 to ¥8,000	15.2%		
	¥8,001 to ¥1,0000	19.5%		

¥1,0000 or more	35.4%

Table 2. Measurement items.

Construct	Items	Source	Item mean (SD)	Composite mean (SD)	Cronbach's α
Engaging behaviors	How often do you In the past three months, how often have you been watching game live streaming and engaging in the following activities in live streaming (1= Very Little; 7 = Very Much)?	Kim & Yang (2017)			
	(1) Watching		5.26(1.04)	5.11(.98)	.76
	(2) Liking		5.35(1.25)		
	(3) Subscribing the live streamer		4.73(1.27)		
	(4) Sharing the live streaming to friends or personal social media		4.48(1.54)	4.45(1.26)	.81
	(5) Creating danmuku or comments in live streaming.		5.16(1.4)		
	(6) Gift giving to the live streamer.		3.72(1.40)		
Modality-based gratification.	On a 7-point scale, please indicate how much you agree with the following statements about game live streaming (1 = Strongly disagree; 7 = Strongly agree):	Sundar & Limpero (2013)		5.77(.60)	.72

	(1) Realism: The experience is like face-to-face.	5.53(.95)		
	(2) Realism: It lets me see the process of playing games.	6.10(.84)		
	(3) Realism: I feel like I am able to experience others playing games without actually being there.	5.87(.90)		
	(4) Novelty: The experience is unusual.	5.56(1.10)		
	(5) Novelty: The experience is not like other social media platforms.	5.83(.93)		
Agency-based gratification	On a 7-point scale, please indicate how much you agree with the following statements about game live streaming platforms (1 = Strongly disagree; 7 = Strongly agree):		5.77(.57)	.71
	(1) Agency enhancement: It allows me to express my thoughts about game live-streaming.	5.72(.88)		
	(2) Agency enhancement: It allows me to send my thoughts about games to many.	5.73(1.00)		
	(3) Community-building: I can connect with other game players.	5.64(1.10)		
	(4) Community-building: It allows me to realize that I am part of the game community.	5.80(.96)		
	(5) Bandwagon: It comforts me to know others' thoughts about games.	5.92(.85)		
	(6) Filtering: It allows me to set my preference.	5.86(.86)		

	(7) Filtering: I can avoid viewing things that I do not want to see.	5.68(.98)		
Interactivity-based gratification	On a 7-point scale, please indicate how much you agree with the following statements about game live streaming platforms (1 = Strongly disagree; 7 = Strongly agree):		5.70(.68)	.81
	(1) Interaction: I can perform a number of tasks with live streaming platforms.	5.46(1.07)		
	(2) Activity: I feel active when I use the live streaming platform.	6.02(.85)		
	(3) Activity: It's not a passive interaction while I use the live streaming platform.	5.63(1.10)		
	(4) Responsiveness: The live-streaming platform responds well to my requests.	5.65(.94)		
	(5) Responsiveness: The live-streaming platform can anticipate my needs.	5.70(.99)		
	(6) Responsiveness: I am able to control my interaction with the live-streaming platform interface.	5.85(.90)		
	(7) Dynamic control: The live-streaming platform allows me to be in charge.	5.57(1.07)		
Navigability-based gratification	On a 7-point scale, please indicate how much you agree with the following statements about game live streaming platforms (1 = Strongly disagree; 7 = Strongly agree):		5.92(.52)	.72
	(1) Browsing: It allows me to browse freely.	5.83(.89)		
	(2) Browsing: It allows me to obtain a wide	5.97(.83)		

	range of information about games.				
	(3) Browsing: It allows me to surf for things that I am interested in.		6.10(.82)		
	(4) Play/fun: It is fun to explore.		5.84(.87)		
	(5) Play/fun: I enjoy escaping into a different world.		5.68(1.05)		
	(6) Navigation aids: It is easy to use and explore.		6.10(.86)		
User identifcation	On a 7-point scale, please indicate how much you agree with the following statements about the live streamer you always watch (1 = Strongly disagree; 7 = Strongly agree):	Hu et al., 2017; Yoshida et al., 2015)		5.64(.70)	.78
	(1) Streamer identification: I am a fan of him/her.		5.83(.94)		
	(2) Streamer identification: Not being able to follow him/her can be frustrating.		5.14(1.22)		
	(3) Streamer identification: I will learn from him/her.		5.57(1.07)		
	(4) Streamer identification: I am willing to tell others that I follow him/her.		5.68(1.17)		
	(5) Group identification: I think other fans of the streamer and I belong to a group.		5.68(1.04)		
	(6) Group identification: This streamer is supported by many people like me.		5.87(.86)		
	(7) Group identification: When I talk about his/her fans' behaviors, I would say		5.71(1.10)		

	"we" rather than "they".

Table 3. Results of hypothesis testing.

Hypothesis	Beta	T value	Result
H1(a): Modality-based gratifications —> Primary engaging behaviors	0.14	2.87**	Supported
H1(b): Modality-based gratifications —> Secondary engaging behaviors	0.05	0.95	Unsupported
H2(a): Agency-based gratifications —> Primary engaging behaviors	-0.42	-0.81	Unsupported
H2(b): Agency-based gratifications —> Secondary engaging behaviors	-0.02	-0.41	Unsupported
H3(a): Interactivity-based gratifications —> Primary engaging behaviors	0.24	4.25***	Supported
H3(b): Interactivity-based gratifications —> Secondary engaging behaviors	0.38	6.35***	Supported
H4(a): Navigability-based gratifications —> Primary engaging behaviors	0.00	0.00	Unsupported
H4(b): Navigability-based gratifications —> Secondary engaging behaviors	-0.12	-2.80**	Unsupported
H5(a): User identification —> Primary engaging behaviors	0.37	8.34***	Supported
H5(b): User identification —> Secondary engaging behaviors	0.27	5.91***	Supported
H6(a): Modality-based gratifications —> User identification	0.21	4.65***	Supported
H6(b): Agency-based gratifications —> User identification	0.17	3.53***	Supported
H6(c): Interactivity-based gratifications —> User identification	0.34	6.43***	Supported
H6(d): Navigability-based gratifications —> User identification	0.13	3.09**	Supported

*Note: *p < .05; **p < .01; ***p < .001. All the coefficients are standardized.*